<Division of Environmental Chemistry> Hydrospheric Environment Analytical Chemistry

Division of Environmental Chemistry
- Hydrospheric Environment Analytical Chemistry -

http://inter3.kuicr.kyoto-u.ac.jp/scope_J.html

Prof
SOHRIN, Yoshiki
(D Sc)

Assoc Prof
UMETANI, Shigeo
(D Sc)

Assist Prof
SASAKI, Yoshihiro
(D Sc)

Assist Prof
OKAMURA, Kei
(D Sc)

Res Associate
NORISUYE, Kazuhiro
(D Sc)

Techn
MINAMI, Tomoharu

Students

KINUGASA, Masatoshi (D3)
KURAHASHI, Kensuke (D2)
MOCHAMAD, Lutfi Firdaus (D1)
LAI, Xiaodong (M2)
NAKATSUKA, Seiji (M2)
YANAI, Kentaro (M2)
MATSUNARI, Takahiro (M1)
SATO, Taishi (M1)
TAGUCHI, Yuusuke (M1)

Visitor

Instr PENG, Xiuhong
Chengdu University of Technology, Sichuan, China, 27 October 2003 - 15 January 2004

Scope of Research

Research activities are concerned with geochemistry, oceanography, limnology and analytical chemistry, which are important basic sciences in order to realize the sustainable society. Major research subjects are as follows: (i) Biogeochemistry of trace elements in the hydrosphere. (ii) Hydrothermal activity and deep biosphere on the ocean floor. (iii) Fe-uptake mechanism of phytoplankton. (iv) Ion recognition. (v) Simulation of non-linear chemical reaction.

Research Activities (Year 2004)

Presentations

Dynamics of bioactive trace metals during the Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS2001), Sohrin Y, Kinugasa M, Okamura K, Takeda S, Nishioka J, Tsuda A, Ocean Research Conference, 19 February 2004.

Development of analysis for suspended particulate metals in seawater and behavior of these elements in Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS2001), Nakatsuka S, Kinugasa M, Sohrin Y, The 65th conference on the Japan Society for Analytical Chemistry, 15 May 2004.

Solvent extraction of divalent metal ions with novel β-Diketone type ligands having crown ether moiety, Kurahashi K, Umetani S, Yamazaki S, Ogura K, The 65th Conference on the Japan Society for Analytical Chemistry, 16 May 2004.

Distribution of trace metals in the Sulu Sea and the adjacent seas, Norisuye K, Ezoe M, Sohrin Y, The 51st Annual Meeting of the Geochemical Society of Japan, 21 September 2004.

Molecular design of solvent extraction reagents highly selective for lanthanide metal ions, Umetani S, International Conference on Rare Earths in Nara, Japan (Rare Earths '04 in Nara), 12 November 2004.

In situ observations of dissolved Manganese in hydrothermal vent plumes at Mariana Trough, Okamura K, Yanai K, Sohrin Y, et al., American Geophisical Union 2004 Fall Meeting, 16 December 2004.

Grants

Sohrin Y, Interaction between metallome and proteome in the marine ecosystem, Grant-in-Aid for Scientific Research (A) (2), 1 April 2004 - 31 March 2007.

Okamura K, Development of time-series measurement system of sulfur related matter in seawater, Grant-in-Aid for Young Scientists B, 1 April 2003 - 31 March 2006.

Distributions of Trace Metals in the Sulu Sea (Philippines) and its Adjacent Basins

Distributions of trace metals in seawater can keenly reflect physical, chemical and biological processes occurring in the ocean. The Sulu Sea (the Philippines) is a deep semi-enclosed basin surrounded by shallow sills (<420 m) and lands, and shows temperature of deep water being ~10°C which is higher than that of open ocean. Therefore, the Sulu Sea is quite different from the open ocean and expected to show unique profiles of trace metals. However, few studies have been made for distributions of trace metals in the Sulu Sea. We observed vertical profiles of dissolved and acid dissolvable Fe, Co, Ni, Cu, Zn, Cd concentrations in the Sulu Sea (Stn. 10, 8°50'N 121°48'E, Dec. 2002) and its adjacent seas, such as the South China Sea (Stn. 16, 13°30'N 119°30'E, Dec. 2002), and western part of the Northwest Pacific (BO7, 22°00'N 151°00'E, July 2000) (Fig. 1).

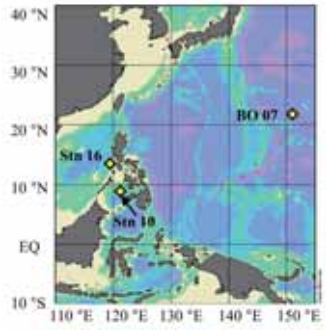

Figure 1. Location of stations (BO7 : the Northwest Pacific, Stn10 : the Sulu Sea, Stn16 : the South China Sea).

Figure 2 shows vertical profiles of dissolved trace metals. Although profiles of dissolved Ni, Zn and Cd in the Northwest Pacific were nutrient like, concentrations of these metals in the Sulu Sea were more uniform below the subsurface. The average concentrations of dissolved Ni, Cu, Zn, Cd in 1000-4000 m in the Sulu Sea were 6.1, 1.5, 3.7, 0.4 nM and were found to be significantly lower than those obtained from the Northwest Pacific (9.5, 3.2, 10.0, 0.9 nM) and the South China Sea (9.0, 2.7, 9.2, 0.8 nM). The difference is also the case for major nutrients and rare earth elements. Because the North Pacific is near the terminal of deep-water circulation in the World Ocean, deep waters of the Northwest Pacific and its adjacent South China Sea are abundant in regenerated nutrients and trace metals mentioned above. Unlike these basins, deep waters of the Sulu Sea would be hardly influenced by nutrient-rich deep waters because of shallow sills, and existing water masses in the deep layer would originate in shallower layer with lower trace metal concentrations. These results suggest that the Sulu Sea is a unique basin compared to the open ocean not only for temperature and major nutrients, but also trace metals.

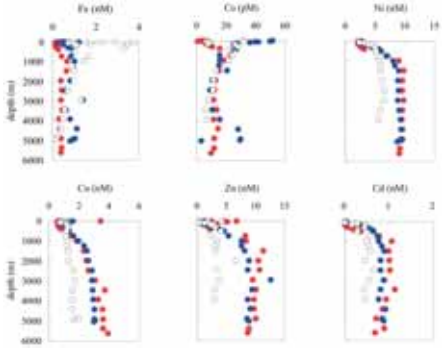

Figure 2. Vertical profiles of dissolved Fe, Co, Ni, Cu, Zn and Cd in the Sulu Sea (white circle), the South China Sea (blue circle) and Northwest Pacific (red circle).

Distributions of Dissolved and Acid Dissolvable Bioactive Trace Metals in the Australian Sector of the Antarctic Ocean (2001 - 2002)

Dissolved and acid dissolvable Fe, Co, Ni, Cu, Zn, Cd and Pb were measured in the Australian sector of the Antarctic Ocean (47-66°S, 140°E) from November 2001 to March 2002.

In upper waters (shallower than 200 m), for Co, Ni, Cu, Zn, and Cd, the concentrations of acid dissolvable species mostly agreed with those of dissolved species within an experimental error, but for Fe and Pb, the concentrations of acid dissolvable were significantly higher than those of dissolved species. Profiles of dissolved and acid dissolvable Fe showed a same tendency of variation to depth and reached maximum concentrations at same depths (Fig.3).

Profiles of dissolved concentrations of all the trace metals showed an inter-latitude variation. Influences of Antarctic Divergence, Antarctic Bottom Water and Antarctic Intermediate Water on the concentrations were observed. Concentrations of dissolved Ni, Cu and Cd showed correlations to those of phosphate at all stations.

Among November 2001, February 2002, and March 2002, dissolved concentrations of trace metals in upper waters at 64°S and 61°S were compared to look a seasonal variation. The concentrations of Co, Ni, Cu, Zn and Cd did not show significant change during the observation.

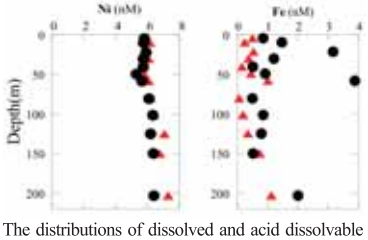

Figure 3. The distributions of dissolved and acid dissolvable Ni and Fe in upper water at 61°S (triangle: dissolved, circle: acid dissolvable).